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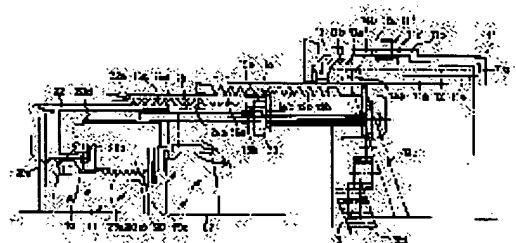
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(54) CYLINDRICAL MOLDING. MOLD FOR CYLINDRICAL MOLDING AND PRODUCTION OF THE CYLINDRICAL HOLDING

### (57) Abstract

**PURPOSE:** To provide a cylindrical molding having an inner gear of a proper shape by forming the spiral inner gear inclined to a circumferential direction and spiral relief grooves which are adjacent to this inner gear and are broader than the tooth width of the inner gear on the inside surface of the cylindrical molding consisting of a resin material.

**CONSTITUTION:** The cylindrical molding, i.e., a rotating cylinder 12, consists of a synthetic resin material and is integrally provided with a spur gear 12a of the circumferential direction on its outer periphery. A fine gear 12b is integrally formed on the outer peripheral part of the front end thereof. In addition, the spiral lead grooves 12c inclined to the circumferential direction, the spiral inclined inner gear 12d inclined to the circumferential direction parallel with these lead grooves 12c and the spiral relief grooves 12e which are adjacent to this inclined inner gear 12d, are larger in diameter than the root circle of the inclined inner gear 12d and are broader than the tooth width are formed on the inside surface of the gear described above. A first advancing and retreating cylinder 14 advances and retreats in an optical axis direction without rotating according to straight guide grooves 11e and the lead grooves 12d when the rotating cylinder 12 is rotationally driven.



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1

## 【特許請求の範囲】

【請求項1】樹脂材料の筒状成形体の内周面に、円周方向に対して傾斜した螺旋状の内歯車と；この内歯車に隣接する、該内歯車の歯幅より幅広で螺旋状の逃げ溝と；を形成したことを特徴とする筒状成形体。

【請求項2】請求項1記載の筒状成形体を成形する成形型であって、

該筒状成形体の外面を形成する上型、及び内面を形成する下型を備え、

かつ、該下型は、

内歯車に対応する螺旋状の歯型部を有する第1筒状型部と；逃げ溝に対応する螺旋状の平面部を有する第2筒状型部と；を備えたことを特徴とする筒状成形体の成形型。

【請求項3】請求項1において、上記内周面にさらに、内歯車と平行な螺旋状のリード溝が形成されている筒状成形体。

【請求項4】請求項3記載の筒状成形体を成形する成形型であって、

該筒状成形体の外面を形成する上型、及び内面を形成する下型を備え、

かつ、該下型は、

内歯車に対応する螺旋状の歯型部を有する第1筒状型部と；逃げ溝に対応する螺旋状の平面部を有する第2筒状型部と；この第2筒状型部が有する、上記リード溝に対応する螺旋状の凸部と；を備えたことを特徴とする筒状成形体の成形型。

【請求項5】請求項1記載の筒状成形体の製造方法であって、

筒状成形体の外面を形成する上型である、内歯車に対応する螺旋状の歯型部を有する第1筒状型部と；逃げ溝に対応する螺旋状の平面部を有する第2筒状型部、及び筒状成形体の内面を形成する下型を組み合わせる第1ステップ；上記上型と下型とで構成する空間に樹脂材料を注入する第2ステップ；上記空間内の樹脂材料が硬化した時点で、第2筒状型部を回転させて上型から離脱させる第3ステップ；上記第1筒状型部を軸方向に移動させて歯型部を内歯車から離脱させて逃げ溝に位置させる第4ステップ；及び、

上記第1筒状型部を回転させて上型から離脱させる第5ステップ；を備えたことを特徴とする筒状成形体の製造方法。

## 【発明の詳細な説明】

## 【0001】

【技術分野】本発明は、筒状成形体、筒状成形体の成形型及びその製造方法に関する。

## 【0002】

【従来技術及びその問題点】ズームレンズ鏡筒には、ズーミングやフォーカシングを行なわせるために、各種の回転筒が備えられている。本出願人が開発中のズームレ

2

ンズ鏡筒においては、回転時に、その内周側に位置する

第1、第2の筒状部材を光軸方向に進退させかつ該第1、第2の筒状部材に回転を伝達する回転筒を用いている。この回転筒は、その回転時に第1筒状部材を光軸方向に進退させると共に、その回転を、内周面に形成した内歯車により、第1筒状部材と共に光軸方向に移動するギヤ等を介して第2筒状部材に伝えている。

【0003】ところで、回転筒の内周面全域に内歯車を形成したのでは、該内周面に他のカム溝等を形成することができなくなる。このため、より適当な形状の内歯車を有する回転筒の出現が切望されている。さらに、このような内歯車を有する回転筒を、樹脂材料により筒体に成形することができる成形型及びその製造方法が切望されている。

## 【0004】

【発明の目的】本発明は、以上の問題意識に基づき、より適当な形状の内歯車を有する筒状成形体を提供することを目的とする。本発明はさらに、該筒状成形体を成形する成形型、及び該筒状成形体の製造方法を提供することを目的とする。

## 【0005】

【発明の概要】上記目的を達成するための本発明は、樹脂材料の筒状成形体の内周面に、円周方向に対して傾斜した螺旋状の内歯車と；この内歯車に隣接する、該内歯車の歯幅より幅広で螺旋状の逃げ溝を形成したこととに特徴を有する。

【0006】また本発明は、筒状成形体を成形する成形型であって、該筒状成形体の外面を形成する上型、及び内面を形成する下型を備え、かつ、該下型は、内歯車に対応する螺旋状の歯型部を有する第1筒状型部と；逃げ溝に対応する螺旋状の平面部を有する第2筒状型部と；を備えたことを特徴としている。

【0007】さらに本発明は、内周面に、内歯車と平行な螺旋状のリード溝を有する筒状成形体を成形する成形型であって、該筒状成形体の外面を形成する上型、及び内面を形成する下型を備え、かつ、該下型は、内歯車に対応する螺旋状の歯型部を有する第1筒状型部と；逃げ溝に対応する螺旋状の平面部を有する第2筒状型部と；この第2筒状型部が有する、上記リード溝に対応する螺旋状の凸部と；を備えたことを特徴としている。

【0008】また本発明は、筒状成形体の製造方法であって、筒状成形体の外面を形成する上型である、内歯車に対応する螺旋状の歯型部を有する第1筒状型部と；逃げ溝に対応する螺旋状の平面部を有する第2筒状型部、及び筒状成形体の内面を形成する下型を組み合わせる第1ステップ；上記上型と下型とで構成する空間に樹脂材料を注入する第2ステップ；上記空間内の樹脂材料が硬化した時点で、第2筒状型部を回転させて上型から離脱させる第3ステップ；上記第1筒状型部を軸方向に移動させて歯型部を内歯車から離脱させて逃げ溝に位置させ

50

る第4ステップ；及び、上記第1筒状型部を回転させて上型から離脱させる第5ステップを備えたことを特徴としている。

## 【0009】

【発明の実施例】以下、図示実施例について本発明を説明する。カメラが有する本実施例のズームレンズ鏡筒は、前群レンズL1と後群レンズL2によってズームレンズ系が構成されており、この前群レンズL1でフォーカシングがなされる。

【0010】図7、図8に示されるように、本発明を適用したカメラのカメラボディ10に一体化された固定鏡筒11には、内筒11aと外筒11bが備えられている。該内筒11aと外筒11bの光軸方向後端部は接続壁11cで接続され、前端部は開放されていて、この開放端から、内筒11aの外周に、回転筒12が回転自在に嵌められている。内筒11aには、撮影光軸Oと平行な方向の直造ガイド溝11eが設けられている。

【0011】本発明の特徴である筒状成形体即ち回転筒12は、合成樹脂材料からなり、図9に示されるように、その外周に、円周方向の平ギヤ12aが一体に設けられ、その先端外周部には細密ねじ12bが一体に形成されている。またその内面には、円周方向に傾斜した螺旋状のリード溝12cと、このリード溝12cと平行な、円周方向に対して傾斜した螺旋状の傾斜インナギヤ(内歯車)12dと、この傾斜インナギヤ12dに隣接して、該傾斜インナギヤ12dの歯底円より大径で、歯幅より幅広かつ螺旋状の逃げ溝12eとが形成されている。

【0012】固定鏡筒11の内筒11aと外筒11bの前端開放部には、外筒11bの内面との嵌合部13aと、細密ねじ12bに螺合するねじ部13bと、内筒11aの外面に当接する当接部13cと、外方フランジ13eを有する支持リング13が固定されている。この支持リング13は、図示しない付勢手段により、固定鏡筒11側に押圧されて一定位置に保持されている。13dは、支持リング13の外周面に形成した回動操作用のギヤである。この支持リング13により、内筒11aと外筒11bの開口部の強度不足を解消することができる。

【0013】固定鏡筒11の外筒11bには、平ギヤ12aと噛み合うピニオン11f用の切欠11dが設けられ、内筒11aには、リード溝12c及び傾斜インナギヤ12d(図1、図2)を露出させる同様の切欠が設けられている。

【0014】固定鏡筒11の内筒11aの内周には、光軸方向に直造移動する第1進退筒14が嵌められている。この第1進退筒14の外周には、固定鏡筒11の直造ガイド溝11eに嵌まる直造ガイド突起14aが一体に設けられ、この直造ガイド突起14a上に、回転筒12のリード溝12c(図1、図2)に嵌まるピン14bが設けられている。またこの第1進退筒14の内周に

は、雌ヘリコイド14cと、光軸と平行な直造案内溝14d(図1、図3)とが形成されている。以上の関係により、回転筒12が回転駆動されると、直造ガイド溝11e及びリード溝12cに従い、第1進退筒14が回転することなく、光軸方向に進退する。

【0015】第1進退筒14の内周には、第2進退筒15が嵌まっている。この第2進退筒15の外周の光軸方向後部には、第1進退筒14の雌ヘリコイド14cに螺合する雄ヘリコイド15aが形成されている。第2進退筒15の内周には、直造ガイド部材16が位置している。この直造ガイド部材16の後端部には、ギヤ支持兼直造ガイド板17が固定ねじ19で固定されている。第2進退筒15には、この直造ガイド部材16と直造ガイド板17とに相対回転自在に挟着される内方フランジ15b(図7、図8参照)が形成されている。また、直造ガイド板17の周縁部に複数個形成した直造案内キー17aは、第1進退筒14の直造案内溝14dに嵌まっている。従って、直造ガイド部材16と直造ガイド板17は、第2進退筒15と相対回転は自在で光軸方向には一體に移動する。すなわち、第2進退筒15は、回転すると、雄ヘリコイド15aと雌ヘリコイド14cに従って、回転しながら、光軸方向に移動し、一方、直造ガイド部材16と直造ガイド板17は回転することなく、第2進退筒15と共に光軸方向に移動する。

【0016】図1に示されるように、直造ガイド部材16は、撮影光軸Oと平行な方向に延出する3個の直造キー16a及び16b'を有している。前群直造ガイド部材18は、該3個の直造キー16a及び16b'と共に結合する。撮影光軸Oと平行な方向に延出する3個の直造キー18aを有している。前群直造ガイド部材18には、固定ねじ21によりシャッターブロック20が固定され、該シャッターブロック20はさらに前群レンズ支持筒22に固定されるもので、従って、シャッターブロック20及び前群レンズ支持筒22は回転が拘束され、光軸方向移動のみが可能である。

【0017】図1と図4に示されるように、シャッターブロック20は、その端部に、雄ヘリコイド20aを有し、この雌ヘリコイド20aに、前群レンズL1を固定したレンズ支持環23の雄ヘリコイド23aが螺合している。このレンズ支持環23は、その前端部に螺合されたレンズ挿入環40とて前群レンズ絆45を構成する。前群レンズ支持筒22の外周面後端部には、レンズ支持環23をズーミング時に光軸方向に移動させるための雄ヘリコイド22aが形成されている。シャッターブロック20は、シャッターフレード20cを有しており、該シャッターブロック20には、FPC基板20dを介して駆動信号が与えられる。

【0018】一方、前群直造ガイド部材18には、後群レンズL2を光軸方向に直造移動させるための後群ガイド面18bが形成されている。後群レンズL2は、後群

レンズ棒24に固定されており、この後群レンズ棒24に、この後群ガイド面18bに係合する直進キー24aが設けられている。そして、この直進キー24a上に、カムピン24bが突出形成されている。

【0019】第2進退筒15には、その内周面に、前群レンズ支持筒22の雄ヘリコイド22aを螺合させる雌ヘリコイド15cと、後群レンズ棒24のカムピン24bを嵌入させるカム溝15dとが形成されている。カム溝15dは、雌ヘリコイド15cの一部を切削する形で、該ヘリコイドと同一の周方向位相において混在している。組立時には、前群レンズ支持筒22の後端部の開放溝22bに後群レンズ棒24のカムピン24bを嵌め、この状態で、カムピン24bはカム溝15dに、雄ヘリコイド22aは雌ヘリコイド15cに、それぞれ係合させる。この係合状態では、第2進退筒15が回転することにより、雌ヘリコイド15cと雄ヘリコイド22aの螺合関係、及び直進ガイド部材16の直進キー16aと前群直進ガイド部材18の直進キー18aとの直進ガイド関係により、前群レンズ支持筒22(前群レンズL1)が光軸方向に直進移動し、また、カム溝15dとカムピン24bの係合関係、及び後群レンズ棒24の直進キー24aと前群直進ガイド部材18の後群ガイド面18bとの直進ガイド関係により、後群レンズ棒24(後群レンズL2)が光軸方向に所定の軌跡で移動し、ズーミングがなされる。

【0020】以上の説明により、回転筒12が回転駆動されると、第1進退筒14が光軸方向に直進移動し、第1進退筒14に対しても第2進退筒15が回転すると、第2進退筒15が回転しながら光軸方向に移動し、前群レンズL1、後群レンズL2が空気間隔を変えながら、直進移動してズーミングがなされることが分かる。

【0021】次に、第2進退筒15に回転を与える駆動機構について説明する。この回転駆動機構は、基本的に、回転筒12の回転を第2進退筒15に伝達するものである。第1進退筒14の後端部には、一对のギヤ支持ブレート26と27が固定ねじ29により固定されている。ギヤ支持ブレート26には、回転筒12の傾斜インナギヤ12dに噛み合うビニオン30(図5、図6参照)が回転自在に支持されている。また第1進退筒14の後端部の周方向に形成した複数の直進案内キー14aのうち2箇所の直進案内キー14aの間に、ビニオン30を収納するビニオン取納空間14eを有する直進案内突起14a'(図3)が形成されている。このビニオン取納空間14eに収納されたビニオン30は、その歯面一部が第1進退筒14の外側から突出する。回転筒12の傾斜インナギヤ12d(図2)は、リード溝12cと平行であるから、回転筒12の回転により第1進退筒14が光軸方向に移動しても、ビニオン30と傾斜インナギヤ12dの噛合関係は維持される。ギヤ支持ブレート26と27の間に、このビニオン30の回転を受ける

ギヤ列31が支持されており、その最終ギヤ31aの端部には、前方に延びる回転伝達シャフト32が一体に固定されている。この回転伝達シャフト32は、非円形の一様断面をしている。

【0022】一方、直進ガイド部材16の後端面に固定された直進ガイド板17には、この回転伝達シャフト32に対する軸方向の相対移動は自在で一体に回転する取出ビニオン33が軸方向移動を規制した状態で支持されている。つまり、取出ビニオン33は、第2進退筒15の内面に形成した周方向インナギヤ15eと噛み合っている。従って、回転筒12の回転は、第1進退筒14が光軸方向のどの位置にあっても、傾斜インナギヤ12d、ビニオン30、ギヤ列31、回転伝達シャフト32、取出ビニオン33及び周方向インナギヤ15eを介して第2進退筒15に伝達されることとなる。

【0023】上記構成からなる本ズームレンズ鏡筒は、上述の通り、回転筒12が正逆に回転駆動されると、第1進退筒14が光軸方向に直進移動すると共に、第2進退筒15が回転する。第2進退筒15は回転すると、光軸方向に移動し、前群レンズL1、後群レンズL2が空気間隔を変えながら、直進移動してズーミングがなされる。このように、前群レンズL1と後群レンズL2を、図7の収納状態から図8のテレ端位置まで移動させることができ、しかも収納状態において、第1進退筒14及び第2進退筒15が本体外郭(カメラボディ10)、及びレンズカバー筒41から突出しないので、収納長が極めて短くされる。

【0024】次に、図9～図15により、本発明の特徴である上記回転筒(筒状成形体)12を成形する成形型及びその製造方法について説明する。図9に示す回転筒12は、図10に示す成形型35を用いて製造される。この成形型35は、回転筒12の外側を成形する上型40、及び内側を成形する下型41を備えている。この下型41は、回転筒12の傾斜インナギヤ(内歯車)12dに対応する螺旋状の歯型部36aを有する第1筒状型部36と、逃げ溝12eに対応する螺旋状の平面部37aを有する第2筒状型部37とを有している。この第2筒状型部37はさらに、リード溝12cに対応する螺旋状の凸部37bを有している。

【0025】第1筒状型部36は、第2筒状型部37よりも小径に構成した小径筒部36bりと、この小径筒部36bより大径で螺旋状に形成した螺旋状大径部36cを有している。この螺旋状大径部36cの外周縁に、上記歯型部36aが形成されている。第2筒状型部37は、その中央部分に嵌合孔37cを有し、この嵌合孔37cに第1筒状型部36を搭動可能に嵌合している。第2筒状型部37は、平面部37aの凸部37bと凸部37bの間に、係合溝部37dを有している。この係合溝部37d

dは、螺旋状大径部3 6 cと同じ巻き方向の螺旋状に形成されている。第2筒状型部3 7は、この係台溝部3 7 dに螺旋状大径部3 6 cを係合させた状態で図1 0の矢印A方向に回転したとき、係台溝部3 7 dから螺旋状大径部3 6 c(歯型部3 6 a)を次第に離脱させて、傾斜インナギヤ1 2 dと噛み合う歯型部3 6 aを回転筒1 2 内方にそのまま残して回転筒1 2から離脱する。また上型4 0は、図示はしないが、完成した回転筒1 2の取り出しのため、適宜の部分で例えば2つの割り型に分割されるよう構成されている。

【0026】上記構成の成形型3 5を用いて回転筒1 2を製造する場合の工程を説明する。先ず、上型4 0と第1筒状型部3 6と第2筒状型部3 7とを所定の状態に組み合わせ、合成樹脂材料(樹脂材料)を注入して回転筒1 2を成形するための空間を構成する。そしてこの状態において、該空間に合成樹脂材料を注入し、合成樹脂材料が硬化した後、第2筒状型部3 7を図1 0の矢印A方向に回転させて上型4 0から次第に離脱させる(図1 1～図1 2)。このとき、第2筒状型部3 7は、回転しながらその底孔3 7 cから小径筒部3 6 bを離脱させ、傾斜インナギヤ1 2 dと噛み合う歯型部3 6 aを回転筒1 2内方にそのまま残して、回転筒1 2から離反する。

【0027】この後、図1 3に示すように、第1筒状型部3 6を、上型4 0から離反する方向に移動させて、歯型部3 6 aを傾斜インナギヤ1 2 dから離脱させて逃げ溝1 2 e上に位置させる。この状態から今度は、第1筒状型部3 6を、第2筒状型部3 7と同じ方向に回転させる。すると、歯型部3 6 aを有する螺旋状大径部3 6 cが、逃げ溝1 2 eの螺旋に沿って回転筒1 2の内方から離脱する。これにより、上型4 0内に完成した回転筒1 2が残るが、この上型4 0を適宜分割させることにより該回転筒1 2を取り出すことができる。

【0028】

【発明の効果】以上のように本発明によると、内歯車を内周全面に有しない、他のカム溝等を形成することができる筒状成形体を提供することができる。また筒状成形体は逃げ溝を有するから、内歯車の成形時に該内歯車から成形型を離脱せるとときに該逃げ溝を有効に用いることができる。

【0029】また本発明に係る筒状成形体の成形型によれば、筒状成形体の外側を形成する上型、及び内側を形成する下型を備え、かつ該下型は、内歯車に対応する螺旋状の歯型部を有する第1筒状型部と、逃げ溝に対応する螺旋状の平面部を有する第2筒状型部とを備えているから、円周方向に対して傾斜した螺旋状の内歯車と、この内歯車に隣接する逃げ溝を有する筒状成形体を、容易に成形することができる。

【0030】さらに本発明に係る、内歯車と平行な螺旋状のリード溝を有する筒状成形体の成形型によれば、筒状成形体の外側を形成する上型、及び内側を形成する下

型を備え、かつ該下型は、内歯車に対応する螺旋状の歯型部を有する第1筒状型部と、逃げ溝に対応する螺旋状の平面部を有する第2筒状型部と、この第2筒状型部が有する、リード溝に対応する螺旋状の凸部とを備えているから、円周方向に対して傾斜した螺旋状の内歯車と、この内歯車に隣接する逃げ溝と、内歯車と平行な螺旋状のリード溝を有する筒状成形体を、容易に成形することができる。

【0031】また本発明に係る筒状成形体の製造方法によれば、筒状成形体の外側を形成する上型である、内歯車に対応する螺旋状の歯型部を有する第1筒状型部と、逃げ溝に対応する螺旋状の平面部を有する第2筒状型部、及び筒状成形体の内側を形成する下型を組み合わせる第1ステップ；上型と下型とで構成する空間に樹脂材料を注入する第2ステップ；空間内の樹脂材料が硬化した時点で、第2筒状型部を回転させて上型から離脱させる第3ステップ；第1筒状型部を軸方向に移動させて歯型部を内歯車から離脱させて逃げ溝に位置させる第4ステップ；及び、第1筒状型部を回転させて上型から離脱させる第5ステップを備えているから、円周方向に対して傾斜した螺旋状の内歯車と、この内歯車に隣接する逃げ溝を有する筒状成形体を、容易に成形することができる。

#### 【図面の簡単な説明】

【図1】ズームレンズ鏡筒の実施例を示す、大略の分解斜視図である。

【図2】同ズームレンズ鏡筒の後方部分の拡大斜視図である。

【図3】同ズームレンズ鏡筒の中間部分の拡大斜視図である。

【図4】同ズームレンズ鏡筒の前方部分の拡大斜視図である。

【図5】同ズームレンズ鏡筒の動力伝達系の支持機構を示す斜視図である。

【図6】同動力伝達系のギヤのみの関係を示す斜視図である。

【図7】ズームレンズ鏡筒の収納状態の絶縁上半図である。

【図8】同ズームレンズ鏡筒の最長伸出状態の絶縁上半図である。

【図9】本発明に係る筒状成形体である回転筒を示す斜視図である。

【図10】同筒状成形体を成形型により成形するときの製造工程を示す斜視図である。

【図11】同筒状成形体を成形型により成形するときの製造工程を示す斜視図である。

【図12】同筒状成形体を成形型により成形するときの製造工程を示す斜視図である。

【図13】同筒状成形体を成形型により成形するときの製造工程を示す斜視図である。

【図14】同筒状成形体を成形型により成形するときの  
製造工程を示す斜視図である。

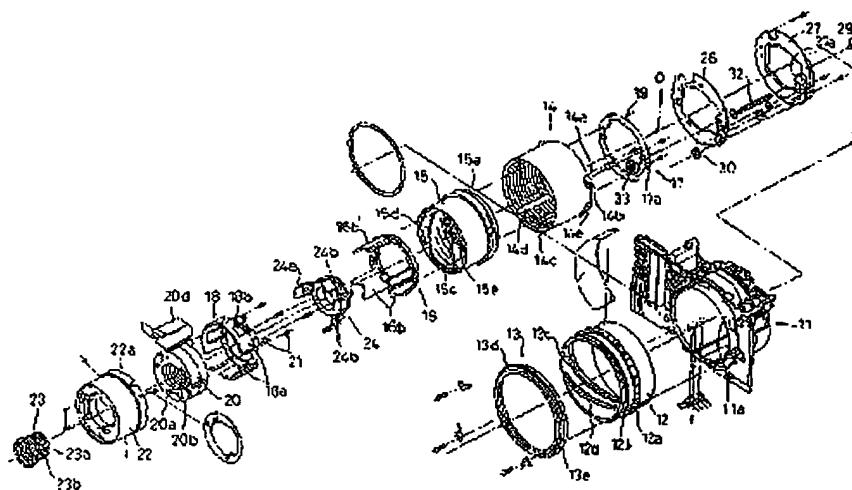
【図15】同筒状成形体を成形型により成形するときの  
製造工程を示す斜視図である

[符号の説明]

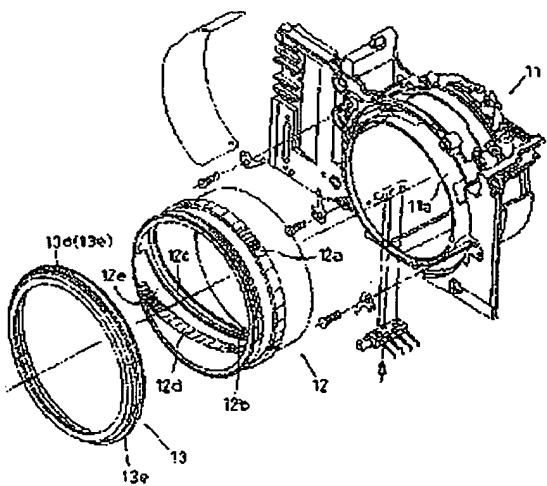
- 12 回転筒（筒状成形体）  
 12c リード溝  
 12d 傾斜インナギヤ（内歯車）  
 12e 逃げ溝  
 35 成形型

\* 40 上型  
 36 第1筒状型部  
 36a 齒型部  
 36b 小徑筒部  
 36c 螺旋狀大徑部  
 37 第2筒狀型部  
 37a 平面部  
 37b 凸部  
 37c 缺合孔  
 本10 37d 係台溝部

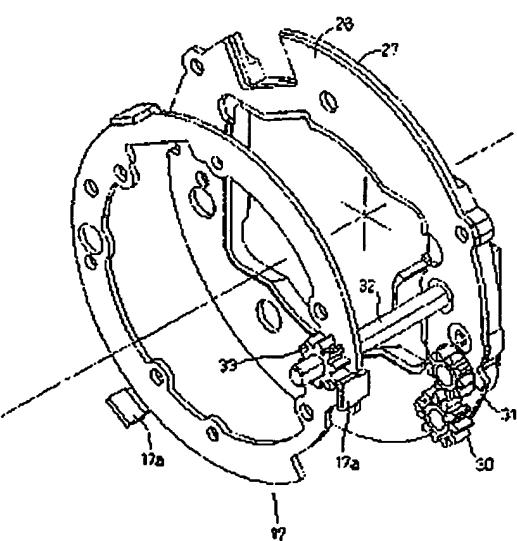
[图 1]



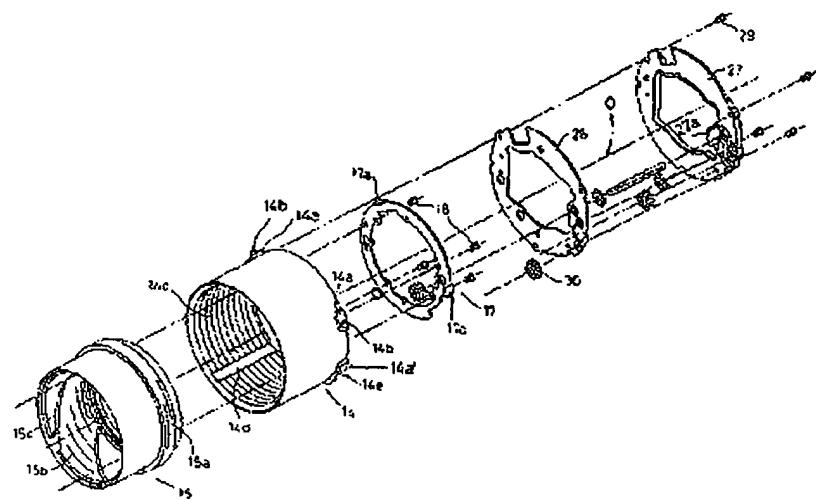
[圖2]



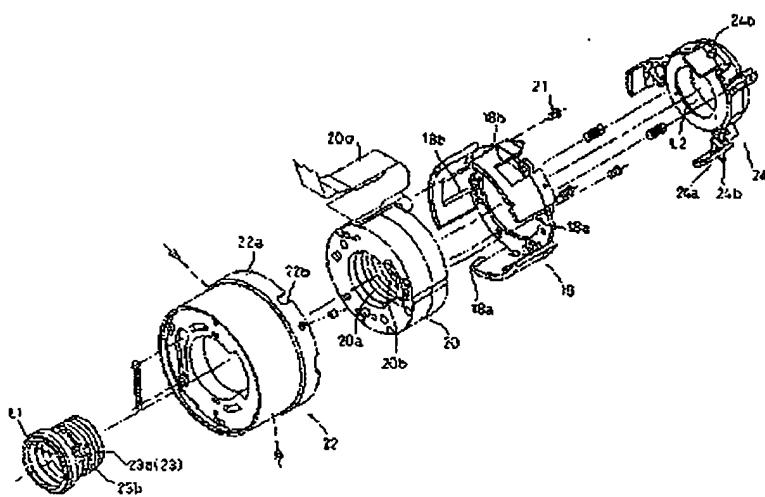
[ 5]



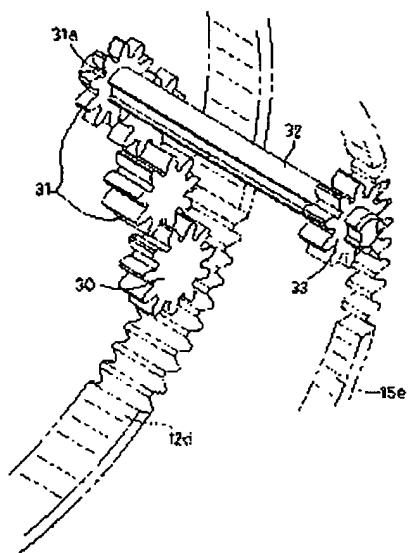
【図3】



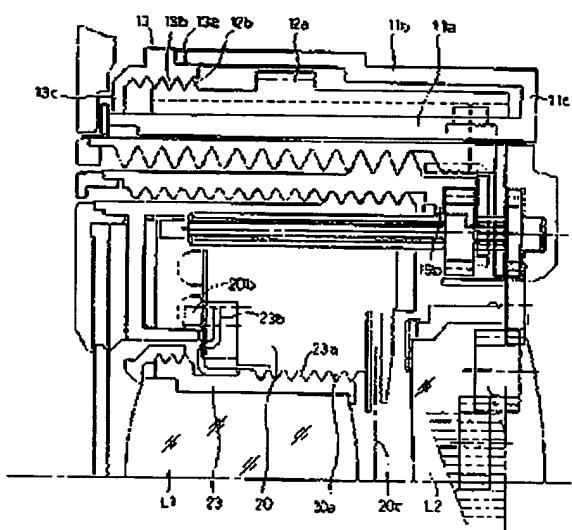
【図4】



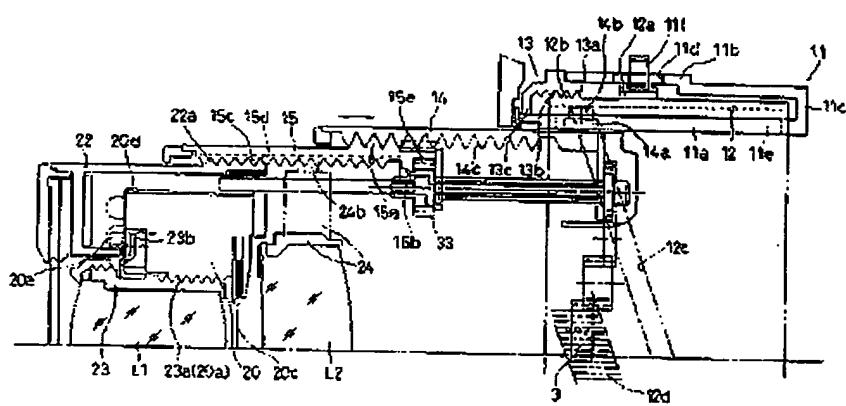
【図6】



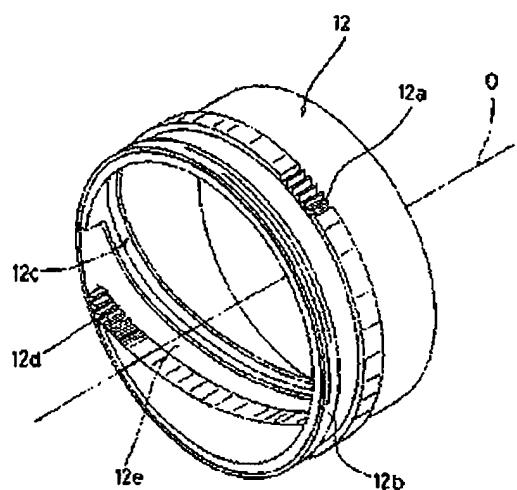
【図7】



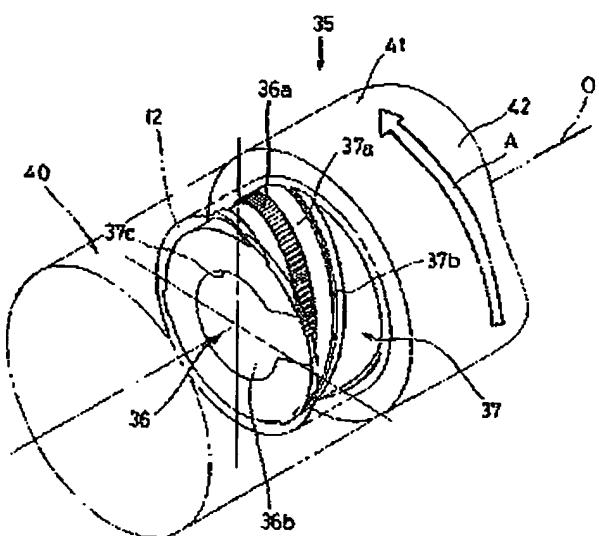
【図8】



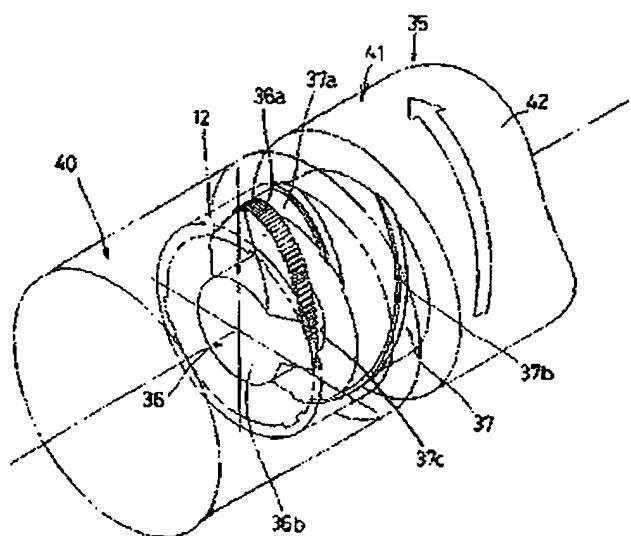
【図9】



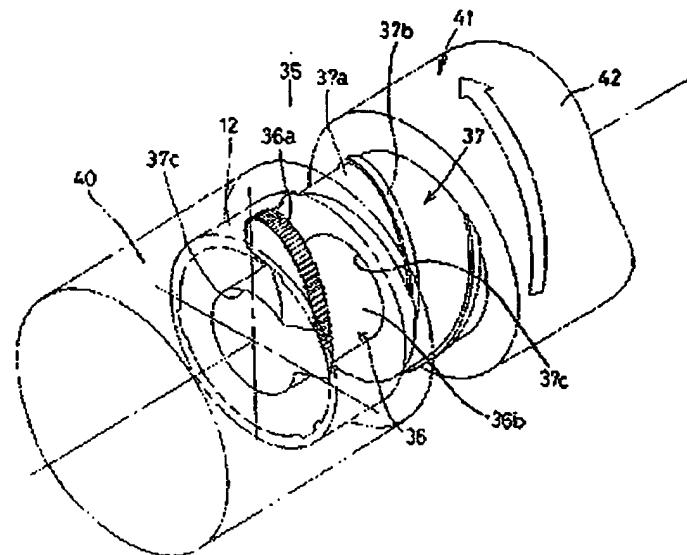
【図10】



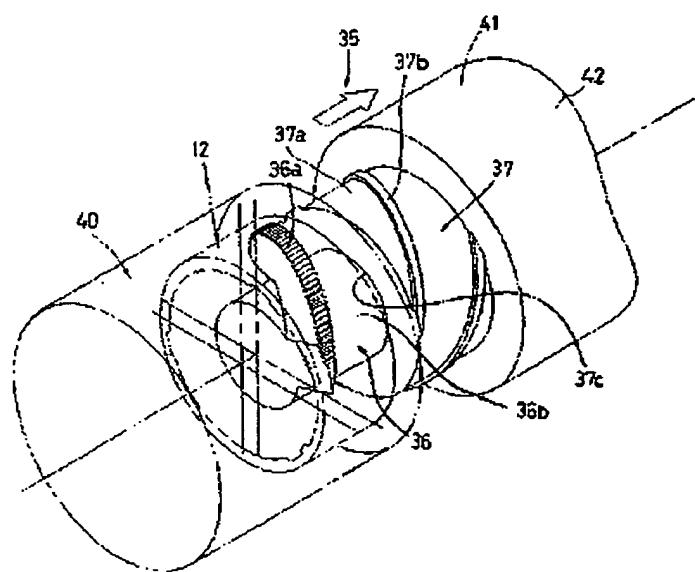
【図11】



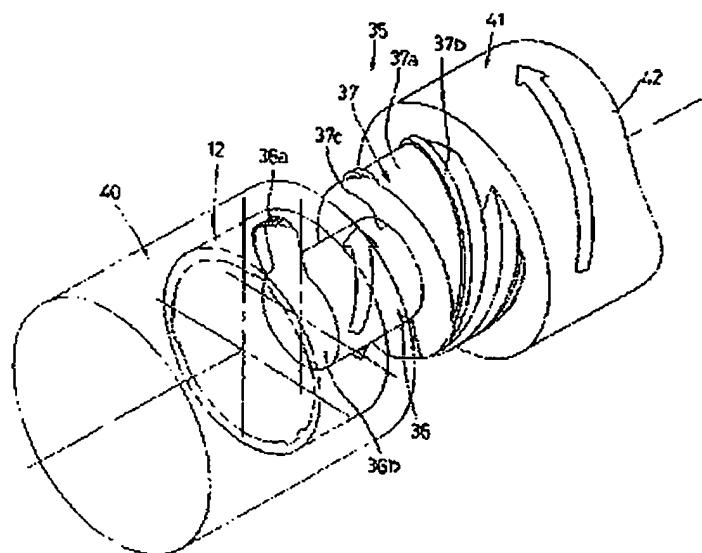
[図12]



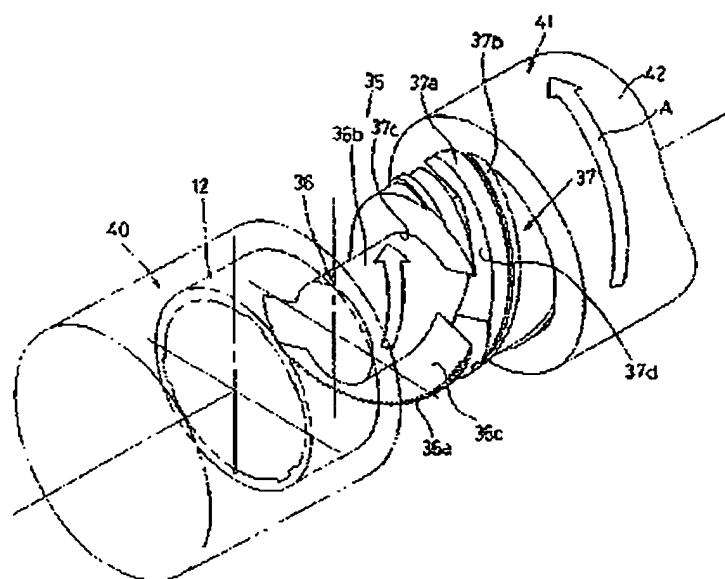
[図13]



[図14]



[図15]



**\* NOTICES \***

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**CLAIMS****[Claim(s)]**

[Claim 1] The spiral internal gear which inclined to the circumferencial direction in the inner skin of the tubed Plastic solid of resin material; the tubed Plastic solid characterized by forming a relief groove and; broader than the face width of this internal gear which adjoins this internal gear, and spiral.

[Claim 2] It is the form block of the tubed Plastic solid characterized by being the form block which fabricates a tubed Plastic solid according to claim 1, and having had the punch which forms the external surface of this tubed Plastic solid, and the female mold which forms an inside, and equipping this female mold with the 1st tubed type section which has spiral \*\*\*\*\* corresponding to an internal gear, the 2nd tubed type section which has the spiral flat-surface section corresponding to; relief groove, and;.

[Claim 3] The tubed Plastic solid by which the spiral lead slot still more nearly parallel to an internal gear is formed in the above-mentioned inner skin in the claim 1.

[Claim 4] It is the form block which fabricates a tubed Plastic solid according to claim 3, and has the punch which forms the external surface of this tubed Plastic solid, and the female mold which forms an inside. and this female mold The 1st tubed type section which has spiral \*\*\*\*\* corresponding to an internal gear, and the 2nd tubed type section which has the spiral flat-surface section corresponding to; relief groove; the form block of the tubed Plastic solid characterized by having the spiral heights and spiral; corresponding to the above-mentioned lead slot which this 2nd tubed type section has.

[Claim 5] The manufacture method of the tubed Plastic solid according to claim 1 characterized by providing the following The 1st tubed type section which is the punch which forms the external surface of a tubed Plastic solid and which has spiral \*\*\*\*\* corresponding to an internal gear The 2nd step which pours resin material into the space constituted from a 1st step; above-mentioned punch which combines the 2nd tubed type section which has the spiral flat-surface section corresponding to a relief groove, and the female mold which forms the inside of a tubed Plastic solid, and female mold; when the resin material in the above-mentioned space hardens The 3rd step which is made to rotate the 2nd tubed type section and is made to secede from a punch; 4th step; which move the above-mentioned 1st tubed type section to shaft orientations, and \*\*\*\*\* is made to secede from an internal gear, and is located in a relief groove, and the 5th step which is made to rotate the above-mentioned 1st tubed type section, and is made to secede from a punch;

[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention relates to the form block and its manufacture method of a tubed Plastic solid and a tubed Plastic solid.

[0002]

[Description of the Prior Art] The zoom lens lens-barrel is equipped with various kinds of tumbling barrels in order to make zooming and focusing perform. in the zoom lens lens-barrel which these people are developing, the 1st and 2nd tubed part material located in the inner circumference side at the time of rotation is moved in the direction of an optical axis -- making -- and -- this -- the tumbling barrel which transmits rotation to the 1st and 2nd tubed part material is used. This tumbling barrel has told the rotation to the 2nd tubed part material by the internal gear formed in inner skin through the gear which moves in the direction of an optical axis with the 1st tubed part material while making the 1st tubed part material move in the direction of an optical axis at the time of the rotation.

[0003] It becomes impossible by the way, to form other cam grooves etc. in this inner skin in having formed the internal gear throughout the inner skin of a tumbling barrel. For this reason, it is anxious for the appearance of the tumbling barrel which has the internal gear of a more suitable configuration. Furthermore, it is anxious for the form block which can fabricate easily the tumbling barrel which has such an internal gear by resin material, and its manufacture method.

[0004]

[Objects of the Invention] this invention aims at offering the tubed Plastic solid which has the internal gear of a more suitable configuration based on the above awareness of the issues. this invention aims at offering further the manufacture method of the form block which fabricates this tubed Plastic solid, and this tubed Plastic solid.

[0005]

[Summary of the Invention] The spiral internal gear toward which this invention for attaining the above-mentioned purpose inclined to the circumferential direction in the inner skin of the tubed Plastic solid of resin material; it has the feature to have formed the relief groove broader than the face width of this internal gear which adjoins this internal gear, and spiral.

[0006] Moreover, this invention is a form block which fabricates a tubed Plastic solid, it has the punch which forms the superficies of this tubed Plastic solid, and the female mold which forms an inside, and this female mold is characterized by having the 1st tubed type section which has the spiral tooth-form section corresponding to an internal gear, and the 2nd tubed type section which has the spiral flat-surface section corresponding to; relief groove.

[0007] Furthermore, this invention is a form block which fabricates the tubed Plastic solid which has a spiral lead slot parallel to an internal gear to inner skin. It has the punch which forms the superficies of this tubed Plastic solid, and the female mold which forms an inside, and this female mold The 1st tubed type section which has the spiral tooth-form section corresponding to an internal gear, and the 2nd tubed type section which has the spiral flat-surface section corresponding to; relief groove; it is characterized by having the spiral heights corresponding to the above-mentioned lead slot which this 2nd tubed type section has.

[0008] Moreover, the 1st tubed type section which has the spiral tooth-form section corresponding to an internal gear which this invention is the manufacture method of a tubed Plastic solid, and is the punch which forms the superficies of a tubed Plastic solid, The 2nd step which pours resin material into the space constituted from a 1st step; above-mentioned punch which combines the 2nd tubed type section which has the spiral flat-surface section corresponding to a relief groove, and the female mold which forms the inside of a tubed Plastic solid, and female mold; when the resin material in the above-mentioned space hardens The 4th step which move the 1st tubed type section of the 3rd step; above which is made to rotate the 2nd tubed type section and is made to secede from a punch to shaft orientations, and the tooth-form section is made to secede from an internal gear, and is located in a relief groove; It reaches. It is characterized by having the 5th step which is made to rotate the above-mentioned 1st tubed type section, and is made to secede from a punch.

[0009]

[Example] Hereafter, this invention is explained about an illustration example. The zoom lens system is constituted by the pre-group lens L1 and the back group lens L2, and, as for the zoom lens lens-barrel of this example which a camera has, focusing is made with this pre-group lens L1.

[0010] As shown in drawing 7 and drawing 8, the fixed lens-barrel 11 united with the camera body 10 of the camera which applied this invention is equipped with container-liner 11a and outer case 11b. The direction back end section of an optical axis of this container-liner 11a and outer case 11b is connected by connection wall 11c, and the front end section is opened wide and inserted in the periphery of container-liner 11a free [ rotation of a tumbling barrel 12 ] from this open end. Rectilinear-propagation guide slot 11e of a direction parallel to the photography optical axis O is prepared in container-liner 11a.

[0011] As it consists of synthetic-resin material, tubed Plastic solid 12, i.e., the tumbling barrel, which is the feature of this invention, and is shown in drawing 9, common gear 12a of a circumferencial direction is prepared in one, and extra-small-screw-thread 12b is

formed in the nose-of-cam periphery section at one at the periphery. Moreover, spiral inclination inner gear (internal gear) 12d parallel to spiral lead slot 12c which inclined in the circumferential direction, and this lead slot 12c which inclined to the circumferential direction, and this inclination inner gear 12d are adjoined, and relief-groove 12e broader than a face width and more nearly spiral than a this inclination inner gear 12d root circle at a major diameter is formed in the inside.

[0012] Fitting section 13a with the inside of outer case 11b, thread-part 13b screwed in extra-small-screw-thread 12b, contact section 13c which contacts the superficies of container-liner 11a, and the retaining ring 13 which has method flange of outside 13e are being fixed to the front end opening section of container-liner 11a of the fixed lens-barrel 11, and outer case 11b. This retaining ring 13 is pressed by the energization means which is not illustrated at the fixed lens-barrel 11 side, and is held by it in the fixed position. 13d is the gear for rotation operation formed in the peripheral face of a retaining ring 13. The shortage of intensity of opening of container-liner 11a and outer case 11b is cancelable with this retaining ring 13.

[0013] 11d of notches for pinion 11f which gear with common gear 12a is prepared in outer case 11b of the fixed lens-barrel 11, and the same notch to which lead slot 12c and inclination inner gear 12d (drawing 1, drawing 2) are exposed is prepared in container-liner 11a.

[0014] The 1st attitude cylinder 14 which carries out rectilinear-propagation movement is inserted in the direction of an optical axis at the inner circumference of container-liner 11a of the fixed lens-barrel 11. Rectilinear-propagation guide salient 14a which fits into rectilinear-propagation guide slot 11e of the fixed lens-barrel 11 is prepared in one, and pin 14b which fits in on this rectilinear-propagation guide salient 14a at lead slot 12c (drawing 1, drawing 2) of a tumbling barrel 12 is prepared in the periphery of this 1st attitude cylinder 14. Moreover, female helicoid 14c and 14d (drawing 1, drawing 3) of rectilinear-propagation guide rails parallel to an optical axis are formed in the inner circumference of this 1st attitude cylinder 14. It moves in the direction of an optical axis, without the 1st attitude cylinder 14 rotating by it according to rectilinear-propagation guide slot 11e and lead slot 12c, if the rotation drive of the tumbling barrel 12 is carried out by the above relation.

[0015] The 2nd attitude cylinder 15 has fitted into the inner circumference of the 1st attitude cylinder 14. Male helicoid 15a screwed in female helicoid 14c of the 1st attitude cylinder 14 is formed in the direction posterior part of an optical axis of the periphery of this 2nd attitude cylinder 15. the inner circumference of the 2nd attitude cylinder 15 -- a rectilinear-propagation guide -- a member 16 -- being located -- \*\*\*\* -- this rectilinear-propagation guide -- the rectilinear-propagation [ gear support-cum- ] guide plate 17 is being fixed to the back end section of a member 16 by the lock screw 19 the 2nd attitude cylinder 15 -- this rectilinear-propagation guide -- inner direction flange 15b (refer to drawing 7 and drawing 8) fastened to a member 16 and the rectilinear-propagation guide plate 17 free [ relative rotation ] is formed Moreover, rectilinear-propagation guidance key 17a formed in the periphery section of the rectilinear-propagation guide plate 17 has fitted into 14d of rectilinear-propagation guide rails of the 1st attitude cylinder 14. [ two or more ] therefore, a rectilinear-propagation guide -- the 2nd attitude cylinder 15 and relative rotation are free, and a member 16 and the rectilinear-propagation guide plate 17 move them in the direction of an optical axis at one namely, -- if the 2nd attitude cylinder 15 rotates, while rotating according to male helicoid 15a and female helicoid 14c -- the direction of an optical axis -- moving -- on the other hand -- a rectilinear-propagation guide -- a member 16 and the rectilinear-propagation guide plate 17 move in the direction of an optical axis with the 2nd attitude cylinder 15, without rotating

[0016] it is shown in drawing 1 -- as -- a rectilinear-propagation guide -- the member 16 has three rectilinear-propagation key 16b and 16b' which extends in the direction parallel to the photography optical axis O a pre-group rectilinear-propagation guide -- a member 18 -- this -- it has three rectilinear-propagation key 18a which engages with three rectilinear-propagation key 16b and 16b' and which extends in the direction parallel to the photography optical axis O a pre-group rectilinear-propagation guide -- the shutter block 20 is fixed to a member 18 by the lock screw 21, this shutter block 20 is further fixed to the pre-group lens support cylinder 22, rotation is restrained, therefore only optical-axis directional movement is possible for the shutter block 20 and the pre-group lens support cylinder 22

[0017] As shown in drawing 1 and drawing 4, the shutter block 20 has female helicoid 20a in the shank, and male helicoid 23a of the lens support ring 23 which fixed the pre-group lens L1 at this female helicoid 20a is screwing it in it. This lens support ring 23 constitutes the pre-group lens frame 45 from a lens presser-foot ring 40 screwed in the front end section. Male helicoid 22a for moving the lens support ring 23 in the direction of an optical axis at the time of zooming is formed in the peripheral face back end section of the pre-group lens support cylinder 22. The shutter block 20 has shutter blade 20c, and a driving signal is given to this shutter block 20 through 20d of FPC substrates.

[0018] on the other hand -- a pre-group rectilinear-propagation guide -- back group guide side 18b for making rectilinear-propagation movement of the back group lens L2 carry out in the direction of an optical axis is formed in the member 18 The back group lens L2 is being fixed to the back group lens frame 24, and rectilinear-propagation key 24a which engages with the group lens frame 24 after this at group guide side 18b is prepared after this. And cam-pin 24b is projected and formed on this rectilinear-propagation key 24a.

[0019] 15d of cam grooves which make female helicoid 15c which makes male helicoid 22a of the pre-group lens support cylinder 22 screw in the inner skin, and cam-pin 24b of the back group lens frame 24 insert in the 2nd attitude cylinder 15 is formed. 15d of cam grooves is the form which excises a part of female helicoid 15c, and they are intermingled in the same hoop-direction position as this helicoid. At the time of assembly, cam-pin 24b of the back group lens frame 24 is inserted in open slot 22b of the back end section of the pre-group lens support cylinder 22, cam-pin 24b engages with 15d of cam grooves, and male helicoid 22a is made to engage with female helicoid 15c in this state, respectively. When the 2nd attitude cylinder 15 rotates, in the state of this engagement The screwing relation between female helicoid 15c and male helicoid 22a, and a rectilinear-propagation guide -- rectilinear-propagation key 16b of a member 16, and a pre-group rectilinear-propagation guide -- by the rectilinear-propagation guide relation with rectilinear-propagation key 18a of a member 18 The pre-group lens support cylinder 22 (pre-group lens L1) carries out rectilinear-propagation movement in the direction of an optical axis. moreover, the engagement relation between 15d of cam grooves, and cam-pin 24b, and rectilinear-propagation key 24a of the back group lens frame 24 and a pre-group rectilinear-propagation guide -- the back group lens frame 24 (back group lens L2) moves in the direction of an optical axis by predetermined tracing, and zooming is made by the rectilinear-propagation guide relation with back group guide side 18b of a member 18

[0020] It understands that the 1st attitude cylinder 14 will carry out rectilinear-propagation movement in the direction of an optical axis if the rotation drive of the tumbling barrel 12 is carried out, move in the direction of an optical axis while the 2nd attitude cylinder 15 will rotate, if the 2nd attitude cylinder 15 rotates to the 1st attitude cylinder 14, and carry out rectilinear-propagation movement and zooming is made by the above explanation while the pre-group lens L1 and the back group lens L2 change an air interval.

[0021] Next, the drive which gives rotation to the 2nd attitude cylinder 15 is explained. This rotation drive transmits rotation of a tumbling barrel 12 to the 2nd attitude cylinder 15 fundamentally. The gear support plates 26 and 27 of a couple are being fixed to the back end section of the 1st attitude cylinder 14 by the lock screw 29. The pinion 30 (refer to drawing 5 and drawing 6) which gears to inclination inner gear 12d of a tumbling barrel 12 is supported free [ rotation ] by the gear support plate 26. Between two rectilinear-propagation guidance keys 14, rectilinear-propagation guidance salient 14a' (drawing 3) which has pinion receipt space 14e which contains a pinion 30 is formed among two or more rectilinear-propagation guidance key 14a formed in the hoop direction of the back end section of the 1st attitude cylinder 14 again. As for the pinion 30 contained by this pinion receipt space 14e, the tooth flank part projects from the superficies of the 1st attitude cylinder 14. Inclination inner gear 12d (drawing 2) of a tumbling barrel 12, since it is parallel to lead slot 12c, even if the 1st attitude cylinder 14 moves in the direction of an optical axis by rotation of a tumbling barrel 12, a pinion 30 and an inclination inner gear 12d engagement relation are maintained. Among the gear support plates 26 and 27, the gear train 31 which receives rotation of this pinion 30 is supported, and the rotation transfer shaft 32 ahead prolonged in the shank of the last gear 31a has fixed to one. This rotation transfer shaft 32 is carrying out the uniform cross section of a non-round shape.

[0022] on the other hand -- a rectilinear-propagation guide -- to the rectilinear-propagation guide plate 17 fixed to the back end side of a member 16, the relative displacement of the shaft orientations over this rotation transfer shaft 32 is free, and after the extraction pinion 33 rotated to one has regulated shaft-orientations movement, it is supported That is, the extraction pinion 33 always moves in the rectilinear-propagation guide plate 17 (and the 2 attitude cylinders 15) and the direction of an optical axis together. And this extraction pinion 33 has geared with hoop-direction inner gear 15e formed in the inside of the 2nd attitude cylinder 15. Therefore, even if rotation of a tumbling barrel 12 has the 1st attitude cylinder 14 in which position of the direction of an optical axis, it will be transmitted to the 2nd attitude cylinder 15 through inclination inner gear 12d, a pinion 30, the gear train 31, the rotation transfer shaft 32, the extraction pinion 33, and hoop-direction inner gear 15e.

[0023] The 2nd attitude cylinder 15 rotates this zoom lens lens-barrel which consists of the above-mentioned composition while the 1st attitude cylinder 14 will carry out rectilinear-propagation movement in the direction of an optical axis, if the rotation drive of the tumbling barrel 12 is carried out at right reverse as above-mentioned. If the 2nd attitude cylinder 15 rotates, while it will move in the direction of an optical axis and the pre-group lens L1 and the back group lens L2 will change an air interval, rectilinear-propagation movement is carried out and zooming is made. Thus, by being able to move the pre-group lens L1 and the back group lens L2 from the receipt state of drawing 7 to the tele end position of drawing 8, and moreover reaching 1st attitude cylinder 14 in a receipt state, since project from a main part outline (camera body 10) and the lens covering cylinder 41 and there is no 2nd attitude cylinder 15, receipt length is shortened extremely.

[0024] Next, drawing 9 - drawing 15 explain the form block which fabricates the above-mentioned tumbling barrel (tubed Plastic solid) 12 which is the feature of this invention, and its manufacture method. The tumbling barrel 12 shown in drawing 9 is manufactured using the form block 35 shown in drawing 10. This form block 35 is equipped with the punch 40 which fabricates the superficies of a tumbling barrel 12, and the female mold 41 which fabricates an inside. This female mold 41 has the 1st tubed type section 36 which has spiral tooth-form section 36a corresponding to inclination inner gear (internal gear) 12d of a tumbling barrel 12, and the 2nd tubed type section 37 which has spiral flat-surface section 37a corresponding to relief-groove 12e. This 2nd tubed type section 37 has spiral heights 37b corresponding to lead slot 12c further.

[0025] The 1st tubed type section 36 has spiral major-diameter section 36c formed more nearly spirally [ in a major diameter ] than minor diameter cylinder part 36b constituted from the 2nd tubed type section 37 in the minor diameter, and this minor diameter cylinder part 36b. The above-mentioned tooth-form section 36a is formed in the periphery edge of this spiral major-diameter section 36c. the 2nd tubed type section 37 -- a part for the center section -- fitting -- a hole -- 37c -- having -- this fitting -- a hole -- it has fitted into 37c possible [ sliding of the 1st tubed type section 36 ] The 2nd tubed type section 37 has 37d of engagement slots between heights 37b of flat-surface section 37a, and heights 37b. 37d of this engagement slot is formed spirally [ the same direction of a volume as spiral major-diameter section 36c ]. When it rotates in the direction of arrow A of drawing 10 in the state where spiral major-diameter section 36c was made to engage with 37d of this engagement slot, the 2nd tubed type section 37 makes spiral major-diameter section 36c (tooth-form section 36a) secede from 37d of engagement slots gradually, leaves tooth-form section 36a which gears with inclination inner gear 12d to the method of the inside of a tumbling barrel 12 as it is, and secedes from a tumbling barrel 12. Moreover, for the ejection of the completed tumbling barrel 12, although illustration is not carried out, the punch 40 is constituted so that it may be divided into two rate types in a proper portion.

[0026] The process in the case of manufacturing a tumbling barrel 12 using the form block 35 of the above-mentioned composition is explained. First, a punch 40, the 1st tubed type section 36, and the 2nd tubed type section 37 are combined with a predetermined state, and the space for pouring in synthetic-resin material (resin material) and fabricating a tumbling barrel 12 is constituted. And after it pours synthetic-resin material into this space and synthetic-resin material hardens, the 2nd tubed type section 37 is rotated in the direction of arrow A of drawing 10, and it is made to secede from a punch 40 gradually in this state (drawing 11 - drawing 12), while the 2nd tubed type section 37 rotates at this time -- the fitting -- minor diameter cylinder part 36b is made to secede from hole 37c, it leaves tooth-form section 36a which gears with inclination inner gear 12d to the method of the inside of a tumbling barrel 12 as it is, and a tumbling barrel 12 is deserted

[0027] Then, move the 1st tubed type section 36 in the direction which deserts a punch 40, and you make tooth-form section 36a secede from inclination inner gear 12d, and make it located on relief-groove 12e, as shown in drawing 13. Shortly, the 1st tubed type section 36 is rotated in the same direction as the 2nd tubed type section 37 from this state. Then, spiral major-diameter section 36c which has tooth-form section 36a secedes from the inner direction of a tumbling barrel 12 along with the spiral of relief-groove 12e. Although the tumbling barrel 12 completed in the punch 40 remains by this, this tumbling barrel 12 can be taken out by making this

punch 40 divide suitably.

[0028]

[Effect of the Invention] According to this invention, the tubed Plastic solid which does not have an internal gear all over inner circumference and which can form other cam grooves etc. can be offered as mentioned above. Moreover, since a tubed Plastic solid has a relief groove, when making a form block secede from this internal gear at the time of fabrication of an internal gear, it can use this relief groove effectively.

[0029] According to the form block of the tubed Plastic solid concerning this invention, it has the punch which forms the superficies of a tubed Plastic solid, and the female mold which forms an inside. moreover, and this female mold The spiral internal gear which inclined to the circumferencial direction since it had the 1st tubed type section which has the spiral tooth-form section corresponding to an internal gear, and the 2nd tubed type section which has the spiral flat-surface section corresponding to a relief groove, The tubed Plastic solid which has the relief groove which adjoins this internal gear can be fabricated easily.

[0030] According to the form block of the tubed Plastic solid which has the spiral lead slot parallel to an internal gear which furthermore starts this invention, it has the punch which forms the superficies of a tubed Plastic solid, and the female mold which forms an inside. and this female mold The 1st tubed type section which has the spiral tooth-form section corresponding to an internal gear, and the 2nd tubed type section which has the spiral flat-surface section corresponding to a relief groove, Since it has the spiral heights corresponding to the lead slot which this 2nd tubed type section has, the tubed Plastic solid which has the spiral internal gear which inclined to the circumferencial direction, the relief groove which adjoins this internal gear, and a spiral lead slot parallel to an internal gear can be fabricated easily.

[0031] Moreover, the 1st tubed type section which has the spiral tooth-form section corresponding to an internal gear which is the punch which forms the superficies of a tubed Plastic solid according to the manufacture method of the tubed Plastic solid concerning this invention, The 1st step which combines the 2nd tubed type section which has the spiral flat-surface section corresponding to a relief groove, and the female mold which forms the inside of a tubed Plastic solid; when the resin material in the 2nd step; space which pours resin material into the space constituted from a punch and female mold hardens The 4th step which move the 1st 3rd step; tubed type section which is made to rotate the 2nd tubed type section and is made to secede from a punch to shaft orientations, and the tooth-form section is made to secede from an internal gear, and is located in a relief groove; It reaches. Since it has the 5th step which is made to rotate the 1st tubed type section and is made to secede from a punch, the tubed Plastic solid which has the relief groove which adjoins the spiral internal gear which inclined to the circumferencial direction, and this internal gear can be fabricated easily.

[Translation done.]

## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

## [Brief Description of the Drawings]

- [Drawing 1] It is the decomposition perspective diagram of a profile showing the example of a zoom lens lens-barrel.  
 [Drawing 2] It is the expansion perspective diagram of the back portion of this zoom lens lens-barrel.  
 [Drawing 3] It is the expansion perspective diagram of the interstitial segment of this zoom lens lens-barrel.  
 [Drawing 4] It is the expansion perspective diagram of the front portion of this zoom lens lens-barrel.  
 [Drawing 5] It is the perspective diagram showing the support mechanism of the power transfer system of this zoom lens lens-barrel.  
 [Drawing 6] It is the perspective diagram showing the relation of only the gear of this power transfer system.  
 [Drawing 7] It is the vertical section Johan view of the receipt state of a zoom lens lens-barrel.  
 [Drawing 8] It is the vertical section Johan view of the longest delivery state of this zoom lens lens-barrel.  
 [Drawing 9] It is the perspective diagram showing the tumbling barrel which is a tubed Plastic solid concerning this invention.  
 [Drawing 10] It is the perspective diagram showing the manufacturing process when fabricating this tubed Plastic solid with a form block.  
 [Drawing 11] It is the perspective diagram showing the manufacturing process when fabricating this tubed Plastic solid with a form block.  
 [Drawing 12] It is the perspective diagram showing the manufacturing process when fabricating this tubed Plastic solid with a form block.  
 [Drawing 13] It is the perspective diagram showing the manufacturing process when fabricating this tubed Plastic solid with a form block.  
 [Drawing 14] It is the perspective diagram showing the manufacturing process when fabricating this tubed Plastic solid with a form block.  
 [Drawing 15] It is the perspective diagram showing the manufacturing process when fabricating this tubed Plastic solid with a form block.

## [Description of Notations]

- 12 Tumbling Barrel (Tubed Plastic Solid)  
 12c Lead slot  
 12d Inclination inner gear (internal gear)  
 12e Relief groove  
 35 Form Block  
 40 Punch  
 36 1st Tubed Type Section  
 36a Tooth-form section  
 36b Minor diameter cylinder part  
 36c Spiral major-diameter section  
 37 2nd Tubed Type Section  
 37a Flat-surface section  
 37b Heights  
 37c fitting -- a hole  
 37d Engagement slot

[Translation done.]